

tion at Kalianpur has now been made: at this station the attraction of the southern mass appears to be considerably greater than that of the northern and the resulting deflection of the plumb-line is calculated to be 6"4 south.

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*Modified Apparatus for the Measurement of Colour, and its Application to the Determination of the Colour Sensations.*

By Sir WILLIAM DE W. ABNEY, K.C.B., D.C.L., D.Sc., F.R.S.

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(Abstract.)

The author describes a modification of his colour patch apparatus, in which two spectra are produced by the same beam that passes through the collimator and prisms. With this apparatus two distinct patches of pure or mixed colours can be placed side by side upon a white screen, and when a set of three slits is placed in each spectrum, mixtures in one spectrum can be matched with mixtures in the other, or with pure colours and white combined.

This new apparatus, in which also the positions of the slits in the two spectra could be most accurately determined, was used for a redetermination of the visual sensation curves.

The fourth sensation, supposed by Burch to exist in the violet, cannot be traced, and in the author's opinion is unnecessary. The amount of inherent white in the colour which best represents the green sensation is redetermined, and found to differ slightly from that found previously, as is also the amount of blue sensation in the yellow and green part of the spectrum. This last was only practicable by means of the new apparatus, which enabled pure colours to be isolated in one spectrum, and by mixtures matched in the other. There is also a redetermination of the three sensations in the other parts of the spectrum. The curves so determined vary slightly from those given in the author's previous communication.\* In the full paper the various equations for the colour sensations are discussed, and examples in detail given, and finally the curves are tabulated, and the sensation curves for equal stimuli derived from them.

In another table the sensation composition in luminosities of the spectrum colours, when all white has been deducted, is given, and the plotted curves

\* 'Phil. Trans.,' "The Colour Sensations in Terms of Luminosity," 1899.

of the three sensations and white show that there is no abrupt increase and consequent abrupt diminution in the white component. This is not the case in the curves which up to now have been given.

The sensation and "equal stimulus" curves are given for the normal spectrum. The latter part of the paper describes the use to which the last table can be put in ascertaining the dominant wave-length of any mixed colour, and the amount of white mixed with it. By the use of the table the luminosity of the colour can be found, as also its composition in terms of the three sensations. Examples are given, and the application that can be made of the results in making colour sensitometers for colour photography.

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*On the Thermo-electric Junction as a Means of Determining the Lowest Temperatures.*

By Sir JAMES DEWAR, M.A., D.Sc., LL.D., F.R.S.

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The inconvenience of using the gas thermometer at very low temperatures and the failure of platinum and other metal-resistance thermometers within  $30^{\circ}$  or  $40^{\circ}$  of the absolute zero, led me some years ago to consider the experimental behaviour of the thermo-electric junction at the lowest temperatures. My special object at the time the experiments were made was to have a further confirmation of the melting point of hydrogen, and also of the lowest temperature reached on exhausting solid hydrogen, other than that I had found by means of the hydrogen gas thermometer.\* The results have remained unpublished, because my intention has always been to extend them to other thermo-electric combinations. Not having been able to accomplish this project, they are now abstracted as affording useful information in this field of investigation, and as furnishing a general confirmation of my previous investigations.

A German-silver platinum couple was selected as likely to give the most uniform results at low temperatures, although subsequent experiments have led to the conclusion that it would have been better to have replaced the platinum by gold. As regards resistance thermometers, I have shown that gold is more reliable than platinum at temperatures near the boiling point of

\* "The Boiling Point of Liquid Hydrogen, determined by Hydrogen and Helium Gas Thermometers," 'Roy. Soc. Proc.,' vol. 68, 1901.